RESIDUAL STRESS DISTRIBUTIONS IN FERRITIC TO AUSTENITIC STEEL JOINTS MADE BY LASER WELDING

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ABSTRACT

In this study, autogenous laser welding was used to join thin plates of low carbon ferritic and austenitic stainless steel. Due to the differences in the thermo-physical properties of base metals, this kind of weld exhibits a complex microstructure, which frequently leads to an overall loss of joint quality. Four welded samples were prepared by using different sets of processing parameters, with the aim of minimizing the induced residual stress field. The dissimilar austenitic-ferritic joints obtained under all welding conditions were uniform and free of defects. Variations in beam position did not influence the weld geometry, which is a typical keyhole welding. Microstructural characterization and residual strain scanning (by neutron diffraction) were used to assess the features of the joints. By varying laser beam power density and by displacing the laser beam towards the carbon steel side, an optimum combination of processing parameters was found.

KEY WORDS: autogenous laser welding, bi-metallic joint, microstructure, residual stresses

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